

## NCEES Principles and Practice of Engineering Examination PETROLEUM

Effective Beginning with the October 2014 Examinations

- The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour morning session, and 40 multiple-choice questions in the 4-hour afternoon session. Examinee works all questions.
- The exam uses both the International System of units (SI) and the U.S. Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

Approximate  
Percentage of  
Examination

### I. Drilling

**25%**

- A. Casing and tubulars (e.g., collapse, burst, and tensile strength; grade; connections; working design)
- B. Cementing (e.g., properties, yield, placement, downhole equipment, testing protocols)
- C. Drilling fluids (e.g., rheology, chemistry, oil-base/water-base, density, hydrostatics calculations, pore pressure, leakoff, fracture gradients, wellbore stability)
- D. Drill string and BHA (e.g., available weight, overpull, equipment, location in string, tubular movement)
- E. Drilling mechanics (e.g., rock properties, drill-off test, torque and drag)
- F. Hydraulics (e.g., pressure drops, nozzle selection, fluid velocities, ECD, mud pump performance)
- G. Rig equipment capabilities (e.g., equipment, pressure ratings, size and configuration)
- H. Directional/horizontal drilling (e.g., motors, calculations, steering, TVD/MD, horizontal displacement, vertical section)
- I. Wellheads (e.g., equipment, pressure ratings, size and configuration)
- J. Well control/blowout preventer (e.g., kick tolerance, well kill methods, equipment, trip margins, swab and surge pressures)
- K. Solids control (e.g., equipment, process, removal)
- L. Fishing (e.g., equipment, techniques, stretch, stuckpoint, freepoint/backoff)
- M. Bits (e.g., classification, cutting structures, grading, ROP, nozzle size and velocity, jet impact, hydraulic horsepower)
- N. Underbalanced drilling (e.g., candidate selection, air, foam, equipment, rotating blowout preventers)
- O. Deepwater drilling (e.g., rig type, mooring, riser analysis, subsea equipment)

## **II. Production/Completion**

**27.5%**

- A. Lift mechanism selection given a set of well conditions
- B. Sucker rod pumping systems
- C. Gas lift, including intermitters, plunger lifts, and gas lift valves
- D. Downhole pumps, including ESPs, progressing cavity pumps, and jet pumps
- E. Perforating (e.g., size, density, tools, methods, phasing)
- F. Completion and workover fluids
- G. Well and completion systems, including nodal analysis
- H. Inflow/outflow performance curve analysis, including mechanical skin identification
- I. Production logging (e.g., pressure surveys, fluid profiles, cased-hole logs)
- J. Completion tubing and downhole equipment (e.g., zonal isolation, tubular force analysis, packers)
- K. Abandonment (e.g., plug placement, barriers, casing cutting and pulling)
- L. Remedial/recompletion operations (e.g., squeeze cementing, sand and water control, fishing, wireline)
- M. Selection of tubular size and material to accommodate flow rate, pressure and pressure drop considerations, corrosion/erosion
- N. Coiled tubing operations
- O. Production of unconventional reservoirs (e.g., coal bed, shales, tar sands)
- P. Enhanced recovery (e.g., pressure maintenance, miscible injection, water floods, thermal recovery)
- Q. Production chemistry/fluid compatibility (e.g., scale, asphaltene, paraffins, corrosion, hydrates, produced water)
- R. Deepwater production considerations
- S. Well stimulation methods (e.g., fracture treatments, matrix acid treatments)
- T. Rock mechanics, including properties and stability
- U. Production and injection allocation of all fluid streams

## **III. Facilities**

**15%**

- A. Selection of piping to accommodate flow rate, total pressure and pressure drop considerations
- B. Compressor application and sizing parameters
- C. Onsite processing equipment (e.g., separators, heater treaters, dehydrators)
- D. Onsite storage vessels, including piping, valves, and venting
- E. Custody transfer metering devices for oil and gas (e.g., orifice meters, LACT, samplers)
- F. U.S. codes and standards associated with facility design and construction
- G. Hydraulic analysis of fluid collection systems (e.g., slugging, impediments to flow)
- H. Production impact of equipment deficiencies
- I. Pump sizing and selection

- J. Relief and safety system sizing
- K. Materials selection and corrosion inhibition and treating
- L. Facility mass and energy balance
- M. Dynamic effects associated with tank filling/deinventory
- N. Regulatory and environmental support (e.g., emission control and quantification, gas dispersion analysis)
- O. Gas conditioning and treatment (e.g., dehydration, amine sweetening, acid gas treatment, scavenging, dew point control)
- P. Liquid hydrocarbon treatment and processing
- Q. Water treatment and processing
- R. Water and steam quality for injection
- S. Corrosion monitoring location/frequency
- T. Production chemistry/fluid compatibility (e.g., scale, asphaltene, paraffins, corrosion, hydrates)

**IV. Reservoirs 25%**

- A. Empirical decline curve analysis (e.g., rate-time, rate-cum, ratio plots)
- B. Material balance (e.g., hydrocarbons in place, water influx, P/z, drive mechanisms)
- C. Reservoir simulation (e.g., model geometry, model formulation, history matching, model selection)
- D. Well testing (e.g., pressure transient, rate transient, type curve, interference testing, wireline, drillstem test)
- E. Impact of geology on reservoir analysis (e.g., mapping, stratigraphy, faulting, boundaries)
- F. Reservoir geoscience (e.g., lithology, rock mechanics, porosity, permeability, borehole stability)
- G. IOR and EOR (e.g., sweep efficiency, pattern geometry, project selection, design, pressure maintenance)
- H. Drive mechanisms (e.g., identification, production profiles, recovery factors)
- I. Fluid properties and identification (e.g., bubble point, dewpoint, viscosity, compressibility, composition)
- J. Rock properties (e.g., porosity, permeability, compressibility, relative permeability, stress orientation)
- K. Volumetric calculations (e.g., OOIP, OGIP, fluid contacts, aquifers)
- L. Formation evaluation (e.g., logs, appropriate selection, interpretation)

**V. Project Management 7.5%**

- A. Quality assurance/quality control
- B. Cost and schedule management
- C. Management of change
- D. Risk assessments
- E. Petroleum ownership and economics (e.g., cash flows, royalty burdens, interest, capital and operating expenses, financial metrics)